NEVARC NEWS VK3ANE

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North East Victoria Amateur Radio Club http://nevarc.org.au/
An Affiliated club of Wireless Institute of Australia
An Affiliated club of Radio Amateur Society of Australia Inc.

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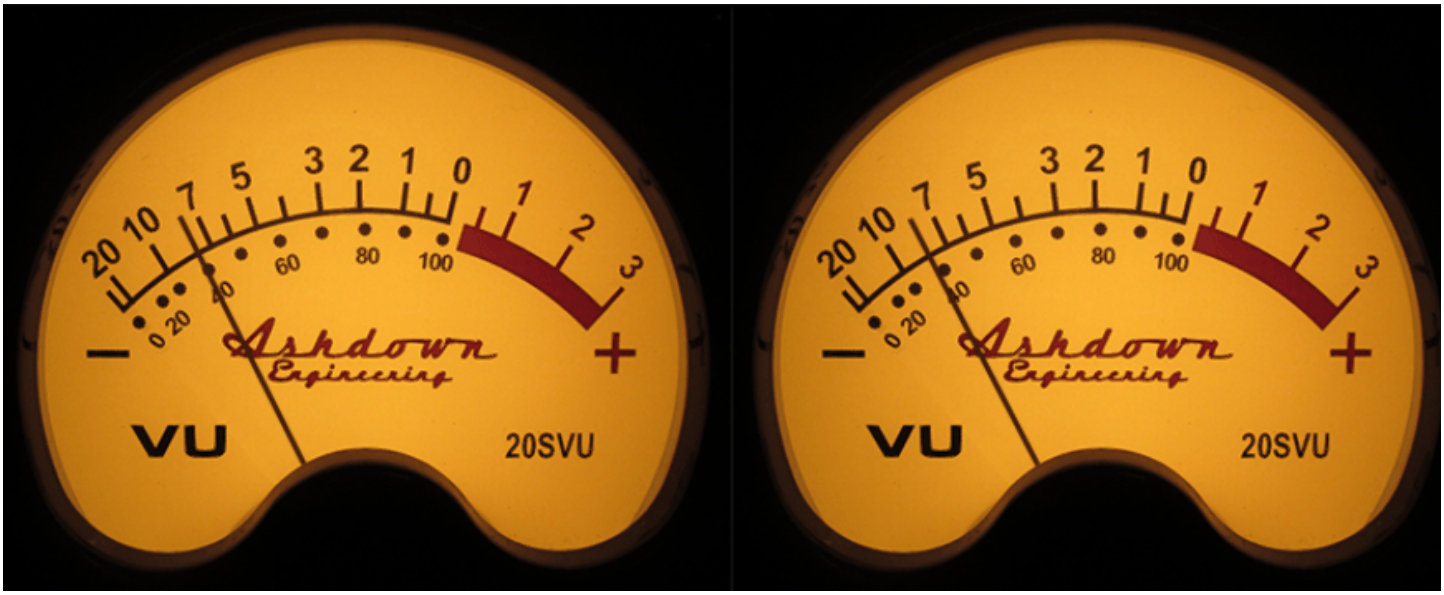
Next Meeting in October
Sunday 9th
Belviour Guides Hall
6 Silva Drive West Wodonga
Meetings start with a 12.00pm BBQ lunch
Call in Via VK3RWO, 146.975, 123 Hz



Nothing quite like the VU meters of old, read all about them this issue

VU Meter

The VU meter on the Television Transmitter had not worked for ages, due to a faulty driver board.
These days it is easier to just replace the driver board than try to find the fault with tiny components.
A replacement was found on EBay, same place I got the first board, but the replacement was faulty as well!
So I ended up fixing the old board by resoldering every terminal wire and that has fixed the intermittent fault.
At $20 it is not worth retuning the faulty board and there is no address to return it to anyway.
That is the second time an EBay "shop" has supplied me with a dud purchase, risks of online shopping I guess.

This got me thinking about the history of VU meters and how they are used.
I still remember watching the VU meters moving across with the music as a kid and our music was far superior than the shit they produce these days.

Today there are so many different types of audio metering that we can choose that it can be overwhelming if you let yourself get caught up in it. The fact is that today's many meter choices all descended from the standard analogue VU meter, which is a lot older than you think.

The standard VU (Volume Unit) meter was designed in 1936 in a joint effort by CBS, NBC and Bell Labs and was originally called the SVI, or Standard Volume Indicator. Since the meter scale was calibrated in Volume Units, that's the name that stuck and became the analogue VU meter that we're used to seeing on all sorts of professional analogue audio gear.

The VU meter was fairly cheap to implement, but had some limitations. For one thing it was rather slow to respond to a signal. That meant that a mix element with fast transients (like drums or percussion) could provide peaks that were as much as 10dB or higher over what the meter was indicating. Also, the meter was built to provide an RMS (an electronic calculation called Root Mean Square) or average value of the signal voltage.

The reference level was 0VU, and anything above was in the red zone and indicated a potential overload, which was true for some inexpensive type gear with low headroom and not so much for professional gear with a great deal of headroom. Later versions of the VU meter also included a peak LED that lit when a predetermined transient level was detected.

Because of these limitations there was a desire by many broadcast mixing engineers for a meter with a faster response. That meter was the PPM (Peak Program Meter), which actually began development before the VU meter in 1932. PPM meters didn't actually measure the signal peak, but were a lot better at detecting those fast transients than normal VU meters were. They were a much more expensive than VU meters as well, which is one of the reasons why they were never put into widespread use in recording studios.

As solid state electronics became more mature and LEDs became cheaper and easier to use, LED segment meters gradually replaced VU meters on all sorts of pro audio gear. Instead of VU-style ballistics, these new meters acted more like peak meters in that they indicated a signal level up to 0 headroom (known as 0dBFS for Full Scale) with a red overload indicator, which we mostly use today in the digital domain.

While the top of a meter scale is usually 0dBFS with an overload indicator above it, the rest of the meter can be calibrated in many different ways that help us view the signal in different ways. The most common types of digital meters used today include signal present, peak, RMS, K-scale, and LUFS.

Believe it or not there are other types of audio metering selections also available, including five versions of digital PPM metering, Linear, Linear Extended, and more. All are designed to do the same thing – tell us the level of the signal, and measure how close to an overload it is. The way this is displayed may be different, but they all serve the same purpose.

You've probably heard of a decibel, right? But what is a decibel, really?

If you're like most people in the field, you might think it has something to do with loudness. Not necessarily.

The decibel by itself doesn't measure volume, loudness or level.

A decibel is really just a ratio that allows you to compare the value of one unit with another using a logarithmic scale.

Just what is a "logarithmic" scale? It's a way of making huge numbers more manageable by compressing their range.

Sound for instance, measured in pascals—a unit for determining physical sound pressure—the difference between the quietest sound you can hear and the very loudest sound you can hear is huge.

The very quietest sound you can hear is about .00002 pascals, while the loudest sound the average person can stand before saying 'It hurts, turn it off!" is about 20 pascals. That's a difference of 10,000,000 times.

It's a lot easier if we just write this as "120 dB", which is a much more easily digestible number. Similar ratios are at play in electrical circuits as well.

Types of dB

The decibel originates in telegraph and telephone industries of the early 1900s, where engineers needed a way to measure how much signal they would lose over a long line.

Back in 1924, Bell Telephone Laboratories came up with the "Transmission Unit" (TU) which was renamed the "decibel" in 1928. This name is derived from bel, a unit of measurement devised in honour of the great telecommunications pioneer Alexander Graham Bell. The "bel" is seldom used due to its large size, and so the deci-bel was the proposed working unit.

When you hear someone says "decibel" they could be referring to many different types. Since decibels are just a way of comparing units with a large difference in magnitude they can be applied in any way you can imagine.

The terms "decibel" doesn't mean much until it's tied to a specific absolute reference point. The trick is to determine what it is you are trying to measure, and then pick a value for "0dB" that makes sense.

dB SPL – As described above, dB SPL is a measure of sound pressure level in the air. 0 dB is normally defined as the quietest sound a person can hear. About 20 micropascals of sound pressure on their ear drum.

dBm – This was the original application of the decibel in audio. It is a power measurement where 0 dB references a 1 mW across a 600 ohm load. This is great for old telephone lines and old-timey motion picture equipment, not so great for modern pro audio circuits.

dBu – This is the norm in professional audio hardware. It's a scale where 0 dB is equal to 0.775 Volts RMS in an unloaded or unterminated circuit. (Hence the "u".) +4 dBu is the voltage reference level used by professional audio product, meaning that when your analog VU meters show "0", you've got 4dB above .775 volts going through your 600 ohm circuit.

dBV – This is a similar idea, where 0dB represents a level of 1 Volt RMS. -10 dBV is the voltage reference level traditionally used by consumer audio products.

DIN Scale – This is a alternate version of the same theme, found mostly in Germany and Austria. This scale uses a +6 dBu reference level for the 0 dB mark.

dBFS – This measurement shows you your level in dB relative to digital full-scale, aka digital 0. You'll find every DAW meter using dbFS. Unlike in analogue equipment, 0 dbFS represents the maximum level before clipping occurs.

Engineers will often shoot for recording input and output levels of anywhere from a low of -22 dbFS to a high of -12dBFS. One of the more popular scales is to have -18 dbFS be equal to 0 on their analogue VU meters. As discussed above, that's usually going to mean a voltage of +4dBu.

Meters: Visualizing dB

Now that you're familiar with decibels, let's try looking at them more closely. Literally. That's where meters come in.

The first attempt at creating standard meters came in the 1920s and 30s, when "copper oxide rectifier power level meters" were being used, but they were deemed inaccurate and not all that useful for monitoring program material.

Eventually, some of the biggest broadcasters in America at the time formed a collaboration to come up with a new standard. The Columbia Broadcasting Company, Bell Telephone Laboratories, and the National Broadcasting Company began searching for a better way to measure program material. They decided on a new type of meter and standard reference level.

In May of 1939, the electronics industry adopted a new reference level of 1 mW at 600 ohms for 0dB which is now the standard for dBm.

Enter the VU Meter

The trusty VU meter was something like the original "loudness" meter.

A volume unit or "VU" meter is a basic volt meter that takes a simple average of the signal and displays it with an attack and release time of around 300 ms.

The slower attack time allows the faster transients to get by before it registers the signal and gives a reading.

Because of these characteristics, the VU meter is fairly accurate when measuring overall level of your program material. It was originally designed as a kind of loudness meter, rather than as a peak meter, the latter of which are more often used to protect you from overages and help make sure you're recording at appropriate levels.

As useful as they are, the problem with the slower attack and release times of VU meters is that transient-heavy material will not read accurately, while a sustained sound such as a bass or guitar will read much higher even, with the same peak voltage. Another issue is that psychoacoustics play a role in how loudness is perceived, which is not factored in to this kind of measurement. (More on this in a minute).

VU Meters (originally called the SVI for Standard Volume Indicator) became standardized by the Acoustical Society of America in 1942. Since the design of VU is fairly simple they were cheap and easy to implement in professional as well as consumer audio equipment.

Typical VU meters usually measure only the upper 23 db of the signal. This is fine for most scenarios, but there are some instances when you'll want to monitor a larger range of more dynamic material. A Wide Range Meter displays program information over +60 db.

Peak Meters

VU meters are popular because the most common time an engineer is using a meter is when judging input and output levels. A meter showing the average level helps to make sure the signal is hitting a unit at the optimal level in order to achieve the best signal to noise ratio.

Peak meters only measure the highest value of the waveform which helps assure the signal being recorded is not clipping or distorting the medium. These meters by design respond to a signal instantaneously and catch all the fast transients, like those found in drums and percussion instruments.

Sudden peaks and transients are the most common culprits of clipping. Since VU meters slow reaction time won't be able to give you an accurate measurement of these sources, peak meters become an important part of an engineers tool kit.

PPM meters can come in analogue or digital form.

PPM Meters

Peak Program Meters are a bit more complex, even though their development actually started prior to the VU, back in 1932.

PPM meters have a much faster attack time, around 4-10ms, and by design are meant to ignore the fastest of transients, encouraging operators to keep levels louder and to ignore the highest peaks.

PPM meters couple this fast attack time with a very slow release, which gives the operator more time to see the peaks and helps reduces eye strain. Since the fast attack time ignores very sudden peaks, these are sometimes referred as "Quasi Peak Meters".

It's important to note however, that peak level tells us almost nothing about perceived loudness and so these types of meters are mostly used for protecting the medium you are recording to.

EXACT verses AVERAGE

A VU meter shows the AVERAGE moment-to-moment volume of an instrument.

This is the opposite of the Full Strength meters in your Digital audio workstation.

They show the EXACT moment-to-moment volume of an instrument.

So technically, VU meters are less accurate than their newer FS cousins.

They're slower.

But what they lack in accuracy, they make up for in realism.

How so?

Well, that leads us directly into…

It's Built Like a Human Ear

FS meters are technically more accurate, yes. You see each momentary peak in the volume level.

But our ears don't hear sound like that.

We hear sound just like a VU meter… in averages!

So even though we're looking at an "inaccurate" meter, we're seeing how our ears are perceiving the instrument.

And ultimately, our ears are what's important. Accuracy be damned.

Another way of thinking about it is this: FS meters show volume. VU meters show loudness.

When you put a VU meter on your instrument, you're seeing the energy and intensity of the sound. You're seeing how your listeners are going to hear it.

That means it's way more useful for your mix.

For example, let's think about a bass guitar. If you look at your DAW's FS meter while it's playing, you'll see the bar jumping up and down every millisecond.

To your eyes, it might look like the bass is extremely dynamic. But to your ears, it just sounds like a nice fat bass.

Now, let's put a VU meter on that same bass guitar and check it out. You'll see that where it was jumping up and down 10 dB before, it's staying around the same area on the volume meter.

So now your meter matches your ears. You can see that it's not a heavily dynamic part. In fact, it's staying around the same volume the entire time.

This is helpful when you're trying to decide which instruments need more compression. If you're trying to control the dynamics of the background instruments, you might be tempted to heavily compress this bass.

But now that we see it has a much smaller dynamic range than we thought, we can do some light compression and move on to another instrument.

There're tons of other ways you can use VU meters to your advantage, especially when it comes to dynamics.

Don't be scared to hit 0 on a VU meter

We know that at above 0 dB Full Scale we start digitally clipping, and any increase in level will destroy our mix. But 0 dBVU is roughly the equivalent of -18 dBFS — a perfectly safe place to be.

You'll notice, too, that VU meters don't stop at 0 and actually go positive by a few dB.

Don't be afraid to push it a bit into the red, on peaks only, remember… "a bit".

~Mick VK3CH

The VU meter standard

In order to provide any meaningful indication of an AC signal a rectifier must be used to generate a proportional DC voltage across the meter coil. This rectifier consists of fairly esoteric low voltage drop elements so as not to decrease the meter's sensitivity to small signals.
All this makes true VU meters rather costly.

The basic requirements of the standard are listed below.

The rectifier should be a low forward voltage full-wave germanium, or now obsolete copper oxide, type so as not to adversely affect the sensitivity of the meter. This is usually included inside of the meter itself.

The meter's scale should be adjusted to compensate to accommodate the forward voltage of the rectifier.

The meter should display 0dB when presented with a sine wave that has an RMS voltage of either 1.228V (+4dBu) for professional line level or 300mV (-10dBV) for consumer line level.

The frequency response of the meter should be down no more than 0.5dB at 25Hz and 25kHz.

The meter should take 300ms to reach 99% of its travel in any direction.

The meter should undershoot by no less than 1% and overshoot no more than 1.5%

The meter should read 0VU when a current of 200µA flows through the coil.

The meter should present a load impedance of 7.5kΩ to the drive circuitry at 0VU. In order to achieve this, it is common practice to connect a 3.6kΩ resistor between the source and the rectifier.

Due to the very tight mechanical tolerances required to do so, it should be apparent that these targets will not be met in the vast majority of domestic (and sometimes even professional) cases.
You can rest assured that any VU meters on domestic recording equipment such as cassette and reel to reel recorders will not conform to the specifications listed above.
This isn't too great a worry as all that we really want is to see a reading of 0VU when the signal reaches a level where distortion will be likely and does so without any significant overshoot, insensitivity to low levels, or a delay of over 500ms or so.
Having said that, it's always good to try and get as close to the real thing as possible when working with lower cost non-standard meters. In many cases meters that fall even just slightly shy of the standard, but are still excellent, will be priced a factor of two lower than ones that meet it.

~Mick VK3CH

HOW TO CALIBRATE A VU METER

Why does a VU meter require calibration?

A VU meter indicates the signal level being sent from the mixer to the next device. A VU meter can be calibrated to any reference level desired.

The most common reference level is 0VU = +4dBm.
That is, when the VU meter needle is lined up with 0 reading on the meter face, the audio signal at the output of the mixer has a level of +4dBm.
Please note that the 0 indication on any VU meter has no pre-determined value.
0 VU is simply a point of reference.

What does +4dBm equal in volts?

+4dBm equals a signal voltage of 1.23 volts measured across a 600 ohm load.

What is required to calibrate a VU meter for a reference level of 0VU = +4dBm?

In addition to basic soldering skills, a soldering iron, and solder, you will require:
A multimeter that can accurately measure audio signal levels at 1,000 Hz.
Do not use inexpensive multimeters as the calibration will not be accurate!

A 600 ohm load resistor. Create a 600 ohm resistor by using one 270 ohm resistor and one 330 ohm resistor.

Solder the lead of one resistor to one lead of the other. This puts the resistors in series and their values add together to create a "new" resistor with a value of 600 ohms.

An XLR female connector to mate with the mixer's male XLR output connector. Remove the outer metal shell of the female XLR connector as it will not be used. Solder one lead of the 600 ohm resistor to pin 2 of the female XLR connector. Solder the other lead of the 600 ohm resistor to pin 3 of the female XLR connector.
A set of insulated alligator clip test leads to connect the multimeter to the 600 ohm load.

If you are using other types of connectors such as a RCA, just place the 600 ohm load across it.
I will just refer to the “connector” for calibration.

What are the steps for calibration?

Connect the connector with the 600 ohm load to the mixer's output.
Using the alligator clip test leads, connect one multimeter probe across the 600 ohm load on the connector.
Power up the multimeter and set it to read AC voltage.
Power up the mixer.
Turn on the mixer's 1kHz tone oscillator.
Turn up the mixer's Master control until the multimeter reads 1.23 volts.

With the multimeter reading 1.23 volts (or as close as possible), adjust the mixer's VU calibration control until the meter reads 0 VU. See your mixer's User Guide to find the location of the VU calibration adjustments.

If you have a stereo mixer, do this same calibration for the Left output and the Right output.

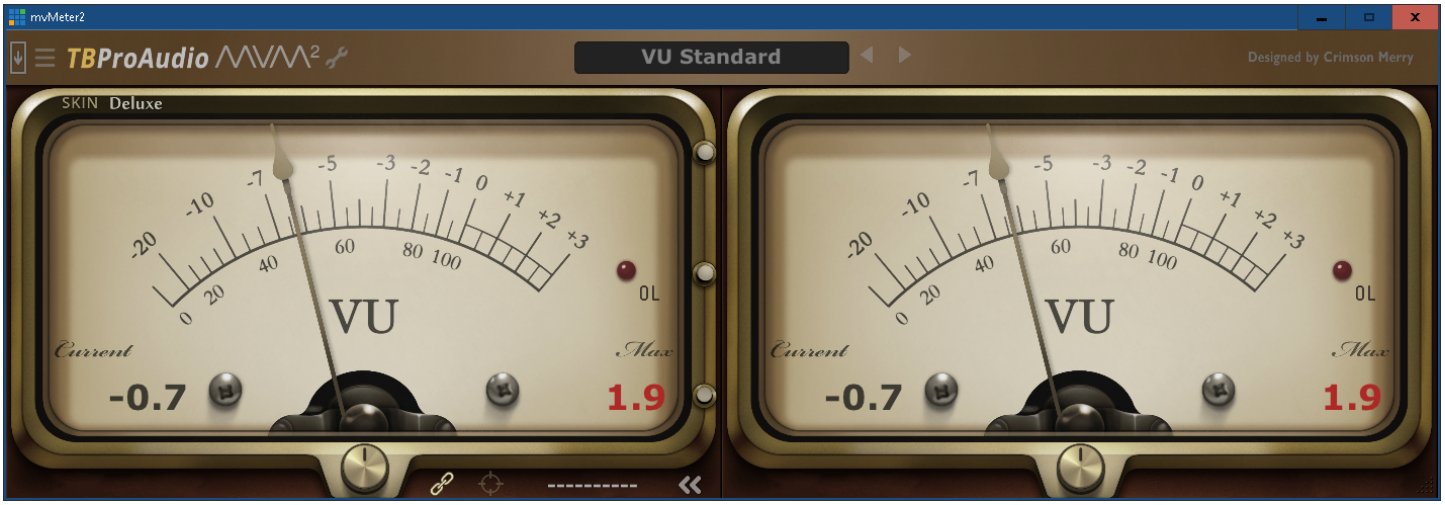
~Mick VK3CH

VU Meter Plug in for vMix

Actually most plug ins will work for lots of applications, not just vMix.
Lots of plug ins are on the internet and it is up you, your personal choice what you select.
The risk of downloading total crap plug ins or viruses is real, so care where you look.

I found one plug in that is good called mvMeter2 a Multivariable meter. It is a free download.
https://www.tbproaudio.de/products/mvmeter2

mvMeter is a multivariable meter including RMS, EBUR128, VU and PPM measurement. mvMeter2 is the successor of mvMeter and adds single/dual meter display, adjustable reference level for all meter modes, adjustable meter delay and preset management.



Screen grab of the plug in running with vMix

It comes with 5 choices of meter face skins.
The deluxe skin is my favourite, has a real 1960's gear look to it.

~Mick VK3CH

Shepparton Hamfest Report

After COVID-19 placing the yearly Hamfest on hold in a lot of places, they are now back. The whole day had prefect weather for both the venue and the drive there. It seemed well attended and we had successful sales with a lot more amateur radio stuff on sale this year.

A lot of faces from Melbourne were seen but I did not see anyone from NEVARC on the day.
I sold much of my stuff at bargain prices, the only way to make them sell.
Like all Hamfests after the prize draw at 12.30 the crowds soon dispersed.
The lunch afterwards at the Australia Hotel was really good and a reasonable price with a generous country style serving size. The on tap pale ale was really good and no more costly than the run of the mill tap beers.

Micks Table

It was a relaxing day out, the profits paid for the day, table hire, fuel and food, both lunch and dinner for many days afterwards, worth doing.

~Mick VK3CH

VK3OTN Broadcasts

First Monday of each month (except January)

10.00 am	Victorian time (all year)	VK3REC 147.175 FM, plus 7.146 MHz LSB.
12.00 noon	Victorian time (all year)	1.825 MHz AM.
08.00 pm	Victorian time (all year)	VK3REC 147.175 FM and 3.650 MHz LSB.
		Interstate relays
10.00 am	WA time (all year)	VK6OTN on 7.088 MHz LSB & NewsWest FM repeaters
01.00	UTC (all year)	14.150 MHz USB beaming **North** from Victoria
07.30 pm	Tasmanian (all year) via the VK7RAA network across northern Tasmania and the VK7RTC network in southern Tasmania.	
08.30 pm	Local time (all year) VK7AX Video Stream via BATC - *www.batc.tv/streams/7ax*	

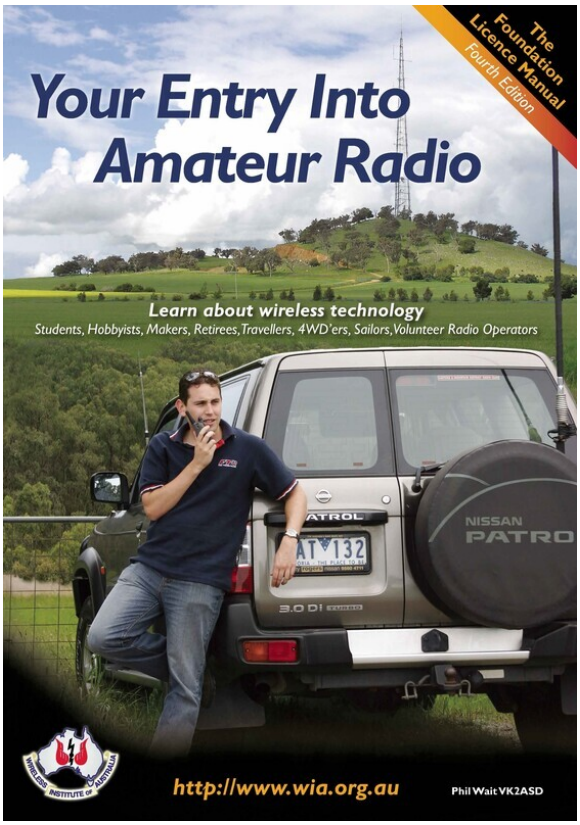
Check the RAOTC web site for a number of other broadcast and beacon relays.

New Foundation Manual Has Arrived – Fourth Edition

The new edition Foundation Licence Manual Edition 4, has landed in the WIA store.
This 4th edition has been totally updated and now includes an introduction to AC theory, capacitors inductors and resonance, digital techniques and ADC/DAC's, decibels, and SDR radios.

Like previous editions, it is intended both as a study guide for obtaining a Foundation grade licence, and as a basic introduction to wireless technology.
It is also an excellent reference source and guide for operational protocols and procedures for the experienced operator.

NEVARC have ordered some copies.

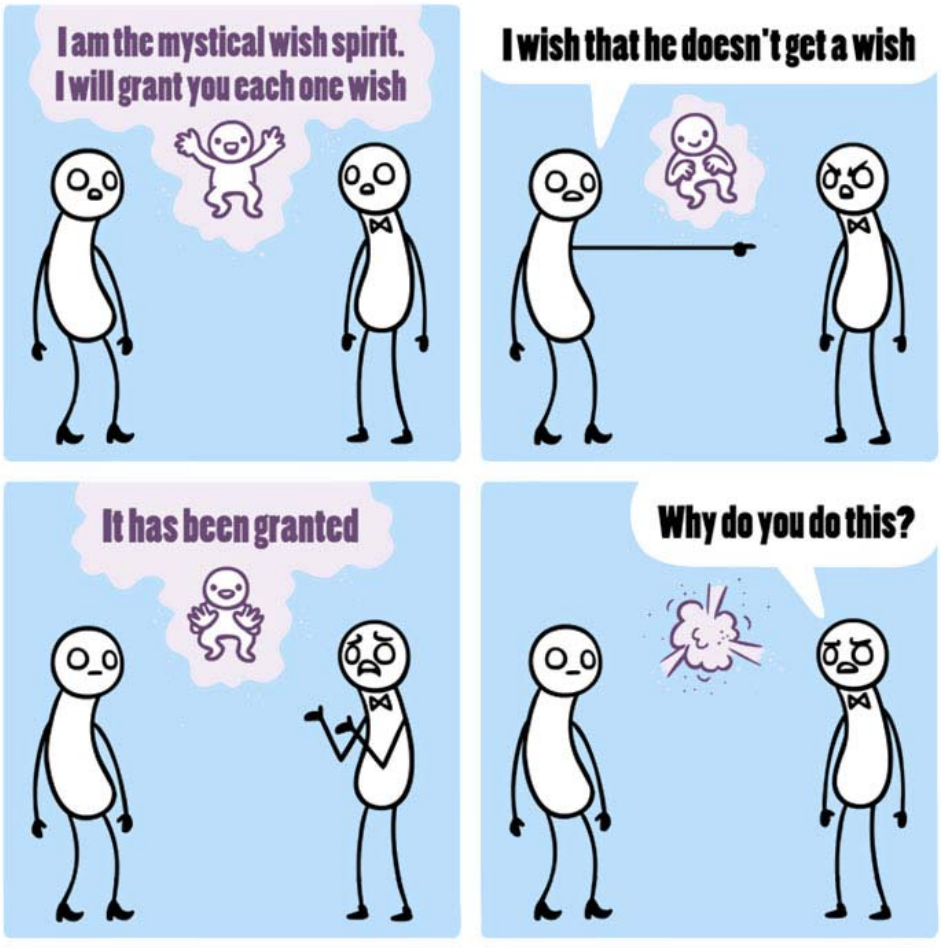



HAPPINESS
IS
A
WARM
TUBE

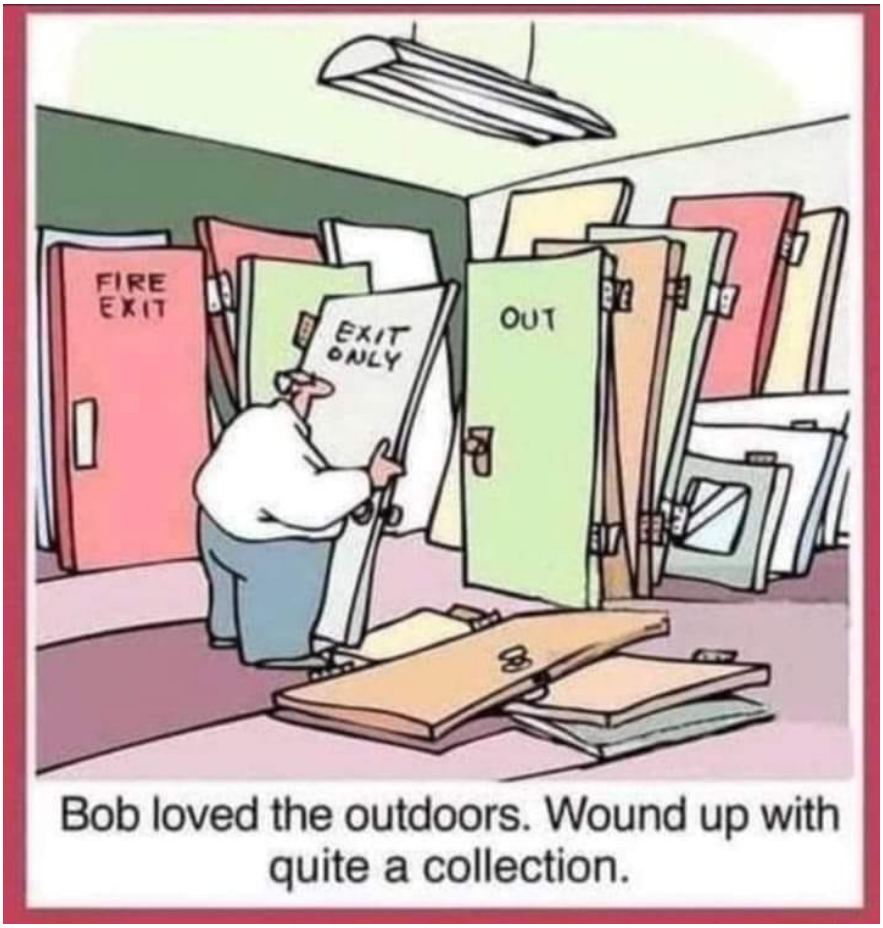
"The last thing I remember is being thrown into the dryer."


IT'S ME, JOHN. THE MONSTER UNDER THE BED! IT SURE HAS BEEN A WHILE, HASN'T IT?
UM, I'M A GROWN UP NOW. MAYBE MONSTERS SHOULDN'T BE TRYING TO SCARE 30 YEAR OLDS..
MAYBE 30 YEAR OLDS SHOULDN'T BE LIVING WITH THEIR PARENTS.
DOGS on the 4th
@dogsonthe4th
I'M GONNA BE A STAR SOME DAY!
NEVER HAPPENIN'. WE'LL ALWAYS BE METEOROIDS
DUDE, WATCH OUT! THE ATMOSPHERE!
LOOK, KIDDO! A SHOOTING STAR!
THIS COMIC MADE POSSIBLE THANKS TO BRANDON DELAMP
@MrLovenstein • MRLOVENSTEIN.COM


You lived a life full of good karma, Buttons. You will return as a human and become one step closer to Nirvana.
Humans... They have responsibilities, right?
Yes, some.
Eh, I'd rather be a lazy piece of shit cat again.
But...
I said eh!
You really do have nine lives, Buttons!
www.mrlovenstein.com


I am the mystical wish spirit. I will grant you each one wish
I wish that he doesn't get a wish
It has been granted
Why do you do this?


IT'S TIME FOR SOME RESOLUTIONS!
FIRST, LET'S SEE WHICH ONES I CAN CROSS OFF FROM LAST YEAR
Resolutions
STOP BREAKING DOORS


FIRE EXIT
EXIT ONLY
OUT
Bob loved the outdoors. Wound up with quite a collection.


NO! NOT HERE!
NOT LIKE THIS!
20 BUCKS
DO YOU HAVE TO DO THIS EVERY TIME I GO TO THE BATHROOM?
YES
THIS COMIC MADE POSSIBLE THANKS TO SHIBBY SAYS
@MrLovenstein • MRLOVENSTEIN.COM


i wonder if this will bounce
theycantalk.com
maybe that one will

Australia Ham Radio 40 Meter Net

7 Days a Week
10am Local time
(East coast)
7.100 MHz LSB
Approximately + or – QRM
Hosted by Ron VK3AHR

NEVARC 2 Meter Net

Net Control VK3ANE

NEVARC Linked Repeaters

VK2RWD, VK3RWO, VK3RWC

Wednesday - 8.00pm
Local time

President, VK3VS, Matt
Vice President, VK2VU, Gary
Secretary, VK2BFC, Frank
Treasurer, Amy Bilston

NEVARC CLUB PROFILE

History

The North East Victoria Amateur Radio Club (NEVARC) formed in 2014.
As of the 7th August 2014, Incorporated, Registered Incorporation number A0061589C.
NEVARC is an affiliated club of the Wireless Institute of Australia and The Radio Amateur Society of Australia Inc.

Meetings

Meetings details are on the club website, the Second Sunday of every month, check for latest scheduled details.
Meetings held at the Belviour Guides Hall, 6 Silva Drive West Wodonga.
Meetings commence with a BBQ (with a donation tin for meat) at 12pm with meeting afterwards.
Members are encouraged to turn up a little earlier for clubroom maintenance.
Call in Via VK3RWO, 146.975, 123 Hz tone.

NEVARC NETS

HF
7.100 MHz 7 Days a Week - 10am Local time

VHF
VK2RWD Wednesday - 8.00pm Local time NEVARC Linked Repeaters: VK2RWD, VK3RWO, VK3RWC

Benefits

To provide the opportunity for Amateur Radio Operators and Short Wave Listeners to enhance their hobby through interaction with other Amateur Radio Operators and Short Wave Listeners. Free technology and related presentations, sponsored construction activities, discounted (and sometimes free) equipment, network of likeminded radio and electronics enthusiasts. Excellent club facilities and environment, ample car parking.

Website: www.nevarc.org.au

Facebook: www.facebook.com/nevicARC/

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All editors' comments and other opinions in submitted articles may not always represent the opinions of the committee or the members of NEVARC, but published in spirit, to promote interest and active discussion on club activities and the promotion of Amateur Radio.
Contributions to NEVARC News are always welcome from members.
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Please include a stamped self-addressed envelope if you require your submission notes returned.
Email attachments not to exceed 5 Mb in file size. If you have more than 5 Mb, then send it split, in several emails to us.
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Other articles credited to outside sources should ask for their permission if they are used.
While we strive to be accurate, no responsibility taken for errors, omissions, or other perceived deficiencies, in respect of information contained in technical or other articles.
Any dates, times and locations given for upcoming events please check with a reliable source closer to the event.
This is particularly true for pre-planned outdoor activities affected by adverse weather etc.
The club website http://nevarc.org.au/has current information on planned events and scheduled meeting dates.
You can get the WIA News sent to your inbox each week by simply clicking a link and entering your email address found at www.wia.org.au The links for either text email or MP3 voice files are there as well as Podcasts and Twitter. This WIA service is FREE.